

## Understanding health beliefs and behaviour in workers with suspected occupational asthma

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# Accepted Manuscript

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## **Understanding health beliefs and behaviour in workers with suspected occupational asthma**

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Occupational asthma; asthma diagnosis; qualitative research

**Abstract**

Long delays from symptom onset to the diagnosis of occupational asthma have been reported in the UK, Europe and Canada and workers are often reluctant to seek medical help or workplace solutions for their symptoms. Reducing this delay could improve workers' quality of life, and reduce the societal cost of occupational asthma. This study aimed to explore reasons behind such delays. A purposive sample of 20 individuals diagnosed with, or under investigation for, occupational asthma (median age=52; 70% male; 80% white British) undertook a single semi-structured interview. Interviews were transcribed verbatim and thematic analysis was undertaken in order to explore health beliefs and identify barriers to diagnosis. Four themes were identified: (1) workers' understanding of symptoms, (2) working relationships, (3) workers' course of action and (4) workers' negotiation with healthcare professionals. Understanding of symptoms varied between individuals, from a lack of insight into the onset, pattern and nature of symptoms, through to misunderstanding of what they represented, or ignorance of the existence of asthma as a disease entity. Workers described reluctance to discuss health issues with managers and peers, through fear of job loss and a perceived lack of ability to find a solution. The evolution of workers' understanding depended upon how actively they looked to define symptoms or seek a solution. Proactive workers were motivated to seek authoritative help and negotiate inadequate healthcare encounters with GPs. Understanding workers' health beliefs will enable policy makers and clinicians to develop better workplace interventions that may aid diagnosis and reduce delay in identifying occupational asthma.

## Introduction

Occupational asthma is a disease characterized by variable airflow limitation and/or hyper-responsiveness, and caused by inhalation of an agent in the workplace [1]. Most cases of occupational asthma have an allergic mechanism, where there is sensitization to an agent after a latent period of exposure [2]. In western industrialized populations occupational asthma is the most frequently reported occupational respiratory disorder [3], and in the UK represents 1 in 6 cases of new-onset adult asthma [4]. Occupational asthma costs the UK £1.1 billion each decade [5]. This cost is to some extent avoidable, since individuals with a short latency between symptom onset and diagnosis or removal from exposure to a sensitizing agent, have a better prognosis when considering lung function and quality of life [4]. However, in cohort studies from the UK and from Canada, mean delays of 3-4 years between symptom onset and diagnosis or referral to a specialist, have been identified [6-8].

One fundamental reason for the delay in diagnosis of occupational asthma is a reluctance to report asthma symptoms by the worker [8]. Fear of losing work time, income or employment, and a lack of awareness of respiratory hazards at work have been cited as potential reasons for this [7-10]. In addition, lay perceptions of health vary according to patients' immediate cultural and social circumstances [11]. Such lay health beliefs may be particular to workers with occupational asthma, a group that comprises predominantly, but not exclusively, skilled and unskilled manual workers. Qualitative research was considered particularly important, since there has been no in depth study of health beliefs in workers with occupational asthma. Therefore, the specific aim of this study was to explore the health beliefs of workers with occupational asthma symptoms and establish a theoretical framework for understanding workers' beliefs and behavior.

## Methods

The consolidated criteria for reporting qualitative research (COREQ) [12] were followed for structure and reporting of the methods section.

### *Study design*

An inductive, phenomenological qualitative methodology was selected as the most appropriate, given the study aims. Data were generated through semi-structured interviews.

### *Setting*

Workers were recruited from the Heart of England NHS Foundation Trust Occupational Lung Disease Unit, a tertiary referral unit based at the Birmingham Chest Clinic. Within this unit 3 occupational lung disease specialist physicians (including the primary author GW) have clinical responsibility for 50-70 new outpatient referrals per annum with suspected occupational asthma. New referrals are taken from primary care, secondary care and occupational health services throughout the West Midlands, UK.

### *Eligibility criteria*

The eligible sample population included any adult of working age who had received a diagnosis of, or was undergoing confirmatory investigations for, occupational asthma. Workers whose first language was not English were eligible with a translator present.

### *Sample selection*

Purposive sampling was undertaken (a non-probability technique where the sample is selected based on prior knowledge of a population and the purpose of the study [13]); the sample included male and female workers of any working-age and ethnicity, with a variety of occupations, based on common exposures associated with occupational asthma [14, 15].

### *Participant recruitment*

Workers meeting the eligibility criteria for the study were approached directly by their attending clinician and referred to the primary author for recruitment and to provide written informed consent.

There were no monetary incentives. The consent process and interviews were undertaken at the same clinic visit. Only one invited worker declined to participate, as he needed to leave quickly following his clinic appointment.

#### *Data collection*

Each participant underwent one face-to-face semi-structured interview with the primary author lasting between 10 and 30 minutes (the majority of interviews lasted 15-20 minutes); all interviews took place in a dedicated clinic room at the unit. A recording of each interview was made using a portable digital audio recorder, and field notes were taken during each interview to document any pertinent non-verbal responses. The initial questions confirmed basic demographic data (age, duration of employment) and thereafter the interview schedule contained five domains: (1) the patient's *understanding of their symptoms*, (2) *initial response to symptoms*, (3) *the general practitioner and occupational asthma*, (4) *social structure and occupational asthma*, (5) *the employer and occupational asthma*. Questions were generated from prevailing ideas within the background literature [6-10, 16] and through discussion with qualitative research and subject specialists (AS, SB, JA). The interview schedule is shown in the supplemental online appendix.

#### *Data transcription*

All interviews were transcribed by hand into Microsoft Word: Mac 2011 Documents (Mac version 14.1.4; Microsoft Corporation, Redmond, WA, USA) by the primary author. Grammar was left unchanged and spelling conventions of Standard UK written English were used. The purpose of this was to aid the readability where there was linguistic variation, particularly where West Midlands' English dialects were used. The meanings of words are shaped by the manner in which they are spoken [17, 18], therefore utterances such as 'um' or 'er', sighs and in-/out-breaths, emphasized words, laughing and coughing, and encouraging noises (such as 'mm'), as well as verbal interactions such as false starts, repetitions, pauses and overlapping speech were included [17, 19]. Non-verbal features were represented only when cited in field notes, where it was felt that they aided the interpretation of accompanying speech. Interruptions were acknowledged but their content not transcribed, and social conversation pre and post each interview was excluded.

### *Thematic analysis*

Thematic analysis was undertaken by the primary author, with a co-investigator (AS) acting as a critical friend [20, 21]. Analysis commenced once data collection was underway, using empirical data driven codes in an inductive process. An interim coding scheme was developed after 10 interviews and the semi-structured interview schedule was adapted to pertinent themes (online supplement contains final interview schedule). Further interviews and analysis were undertaken simultaneously until no further new themes were identified (audit trail is available). Typicality of response and deviant case analysis, as well as the role of the researcher in the research process (reflexivity) were all considered, in order to maximize trustworthiness [13].

### *Reflexivity*

The primary author (GW) is a 36-year old male White British specialist doctor in respiratory medicine. As a consequence, it was particularly important to gain rapport with each subject early during the interview. One particular reason for this was to encourage openness in response to sensitive questions about working and healthcare relationships. The openness of participants may be affected by the fear that criticism regarding an employer can lead to negative employment consequences. The interview site was an empty clinic room in an NHS department, chosen in order that workers could undertake consent and interview in one visit. The primary author explained that clinical judgments were not being made on the basis of participants' responses, however the researchers acknowledged that the interview location can impact on data generation [13, 22]. In a hospital location the identity of the participant as a patient may be more prominent, than, for example a home location where their own identity may be reaffirmed by surroundings. Given the limited time given to establish rapport, the primary investigator stated that confidentiality was assured, interaction was non-judgmental and genuine interest to the participants' experiences was given, within a relaxed atmosphere.

### *Ethical approval*

Ethical approval for the study was granted by the North West (Haydock) National Research Ethics Service (NRES) Committee (REC reference: 13/NW/0035).



## Results

### *Descriptive analysis*

Twenty workers participated in the study (14/20; 70% male) and the median age was 52 (interquartile range=49-57). Sixteen out of 20 (80%) of workers were White British and the other 4 were Pakistani, British Asian (of Pakistani origin), Black Caribbean and White Eastern European (Polish). Workers' occupations and exposures were varied and these are shown in Table 1. Five participants worked in the healthcare industry, and the most commonly encountered causative agents were isocyanates (n=4), wood dust (n=2), metalworking fluids (n=2) and solder flux (n=2).

### *Qualitative analysis*

Four themes concerning health beliefs and health-seeking behavior were identified: (1) the worker's understanding of his/her symptoms, (2) working relationships, (3) the worker's initial course of action, and (4) the worker's negotiation of healthcare encounters. Themes, sub-themes and codes are summarised in Table 2.

#### *Theme 1: The worker's understanding of his/her symptoms*

Five out of 20 (25%) workers lacked insight into the onset of their symptoms, with one worker [P5] suggesting that this was due to the intensity of shift work:

[P5] *"I don't speak with anybody before with this problem [asthma symptoms] because I don't see the problem... After eight hours I think it is a little bit hard to check on these things because you are working, you are tired".*

Nine out of 20 (45%) workers considered asthma symptoms to be normal while working, that is, expected from working with dust or chemicals, normal for undertaking shift work, or part of ageing or deconditioning (illustrated in Table 3). Eight out of 20 (40%) workers appreciated their symptoms but ignored them, either because they appeared to be short self-limiting illnesses, or they were not perceived as serious enough to warrant further attention. Indeed one worker [P12] sought medical assistance only when his symptoms began to impact on him: *"I was leaving my shift early, so obviously I weren't earning my normal wages, so it was starting to impact on my lifestyle, my job and my*

*earnings*". Six out of 20 (30%) workers initially failed to recognize the work-related pattern typical for occupational asthma symptoms, due to their gradual or indistinct onset. In one case [P17] the reasons for this were identified as the symptoms being masked by a hectic lifestyle. Five out of 20 (25%) workers did recognize the work-related pattern but dismissed work as the cause because environments were not dusty, no colleagues were affected, or because there was a long latent exposure before symptom onset (see Table 3).

For 7/20 (35%) workers suspicion of work causation was triggered only by a significant event such as a serious illness (pneumonia, hospital attendance) (3/20; 15%) or a discussion with a colleague regarding the meaning of their symptoms (4/20; 20%).

[P11] *"There was a person at work who had to retire um: for the same reason, retired very early, working in the same theatre, and she said "this is what happened to me, I think it may be happening to you as well"*.

Ten out of 20 (50%) workers recognized their symptoms but misattributed them (Table 3) to recurrent self-limiting respiratory tract infections (4/20; 20%) or other serious illnesses (cancer (3/20; 15%), tuberculosis (1/20; 5%), heart disease (2/20; 10%)); this was often based on previous or family experiences. Importantly 3/20 (15%) workers were unaware of asthma as a disease entity, either with no previous exposure (2/20; 10%) or believing it to be a childhood disease (1/20; 5%). Conversely, one worker [P12] had previously suffered from allergic diseases which enabled him to recognize the symptoms rapidly: *"Yeah well I'd had mild asthma as a child which had gone, I've also had, as a child, hay fever- sort of allergy type things so- no I was aware it was asthma- my partner's got asthma as well"*.

## *Theme 2: Working relationships*

Workers frequently did not discuss their symptoms with work colleagues (see Table 4). Five out of 20 (25%) workers feared that "careless talk" about their ill health would reach management and have a detrimental effect on their employment, through which they might suffer financially. Six out of 20 (30%) workers (all male) stated that health matters were never discussed at work, either because there

was no prevailing culture for open discussion, because colleagues were not able to provide a solution, or if a worker was perceived as unfit by his/her colleagues this might cause antipathy.

Seventeen out of 20 (85%) workers described poor relationships with their employers over health matters. Many of those workers felt that management would not acknowledge their concerns (see Table 4); this was either due to inaction from ignorance of workplace health and safety, or through mistrust of workers' complaints of ill health. In fact 6/20 (30%) workers suggested that their managements only took their concerns seriously once authoritative information was available, such as a report from occupational health or an occupational lung disease specialist. 4/20 (20%) workers identified individual managers who they felt were unsympathetic or ineffectual in dealing with their concerns. 12/20 (60%) workers believed that company productivity was considered more important than the health and safety of employees, and 2/20 (10%) workers felt they were being exposed to an avoidable risk of asthma because their employer would not pay for process control measures, such as local exhaust ventilation on soldering stations [P5]. One worker [P4] was intimidated after raising concerns:

[P4] *"I got warned at work for telling the other ward hostesses who do the same job as me (...) because I seen them at break and they had me in the office and they told me to stay (...) don't come over the other side of the hospital".*

Therefore many workers were dissuaded from discussing their health issues with managers, mainly for fear of being seen as unfit for work and being dismissed, but also because they could not see that it would effect a workplace solution.

However, 2/20 (10%) workers had more positive relationships with their employers; one worker [P2] found his employer to be both communicative and supportive due to trust developed through long service: *"I've been with the company twenty-three years, and I'm quite happy to work there and they have supported me... I'm quite happy that the management know about my issues, and the job they're giving me is suitable"*; the other worker [P11] felt that his manager was supportive and proactive in finding a solution, and was almost being too cautious in redeploying him: *"The theatre manager at the*

*time was very concerned, he wanted to redeploy me to another department and take me out of theatres completely”.*

### *Theme 3: The worker's initial course of action*

Eight out of 20 (40%) workers responded proactively to seek an explanation or solution once they had acknowledged their symptoms. Most workers consulted their GP, although one worker [P2] self-referred to his employer's occupational health. Eight out of 20 (40%) workers were prompted to take action by a family member, particularly when short-lived symptoms had recurred or become permanent: [P2] *“They [patient's family] thought that this coughing is getting regular and, you know, it needs sorting, you need to have a word with the doctor about it”*. Conversely 2 workers felt that their families gave no encouragement to them to seek help due to lack of insight into work processes and the nature of asthma. Additionally one worker [P3] felt stigmatized by his asthma symptoms, which he felt were comparable with those of depression, and would be seen as unfit for work by his family. Two workers described becoming a source of support or authoritative advice for their colleagues:

[P4] *“The girls [colleagues] were asking me how did I get on? You know with tests and that, and I said that er (.) .hhh you know, I said they ought to be careful and- and just watch out for symptoms”*

Six out of 20 (30%) workers sought little in the way of an explanation or a permanent solution. This was manifested by repeated episodes of sickness absence: [P8] *“I was having a lot of time off as well, gave me a lot of hassle at work as well... if I feel that something's not right in there I'll go home”*, or by presenteeism: [P13] *“I've never liked taking time off work, so even when like I've struggled, I've kind of just like persisted and just carried on”*. A variety of reasons for persisting at work while unwell were given by workers, such as fear of financial loss: [P18] *“I mean I could've really come out- really done with coming out of it, but (.) everybody needs to earn a living”*, fear of being penalised: [P8] *“If you have time off they still chuck the rulebook at you. I was feeling ill right but I still had to go to work”*, and a sense of responsibility to the employer: [P12] *“I'm a [shift] manager,*

*so I couldn't really lose much time, you know... I need to be there to run the show really, not sounding silly, you know but- they do rely on some of us".*

#### *Theme 4: The worker's negotiation of healthcare encounters*

Sixteen out of 20 (80%) workers believed that their initial encounter with a healthcare professional, almost exclusively an appointment with their GP, was unhelpful, with inadequate action being taken to explain their symptoms or make a diagnosis. 7/20 (35%) believed that the GP failed to enquire about their occupation or whether their symptoms were work-related; indeed 3/20 (15%) workers stated that they had to prompt the GP in order to enable discussion about risk associated with their job, or the implication of a work-related symptoms: [P20] *"It was me that mentioned work- it was me that said I'm a painter I can't just say I got asthma, that's me I can't work anymore"*. Many workers felt that they were given an inadequate explanation for the work aspects of their symptoms either by being dismissed without further exploration or by over-simplifying the pathology: [P6] *"All the time I'd be sort of struggling with this sort of wheezy sort of chesty cough sort of thing... and they [GPs] sort of went "oh post nasal drip" "*. One worker [P15] believed that his GP dismissed his concerns about the work aspect of his symptoms because he thought that he was exaggerating for financial gain. 7/20 (35%) workers believed that their GP initially followed the wrong diagnostic line: [P7] *"I just had what I call pain in the middle of my chest... so they [GP] always said "it's your heart, it's your heart" 'cos it- at that time I wasn't coughing constantly"*; for some this exploration was understandable, though for others this was an unacceptable cause of delay.

Eight out of 20 (40%) were proactive in negotiating the medical management of their illnesses, by questioning the explanations they were given, or simply asking for a second opinion. 4/20 (20%) workers recognized the limitations of their GP consultations and identified the work link themselves, through Internet research or by evolution of the symptom pattern:

[P20] *"...and then she [practice nurse] just said "you got asthma" (..) and I said well (..) I'm not happy with you just telling me I've got asthma, I paint cars for a living (..) if I go in somewhere and I've got asthma, then that puts me out of work (..) er:: so (..) what sort of asthma have I got, you need to be a bit more specific than that?"*

[P3] *"I started to think, it's actually at its worst (.) in the first few weeks of the course [plumbing course] and then sort of improves, and then it starts off again... when all the soldering were taking place... So then I start to put two and two together",*

[P7] *"I kept saying there's no ventilation, there's no extractor fan. I looked it all up, found out it could cause different types of cancer and that, and said I'm sure it's works related".*

5/20 (25%) workers accepted an initial inaccurate explanation for symptoms by their GP, or in one case by a respiratory physician, because they were seen as an authoritative. One worker [P3] had his own misunderstandings fuelled:

[P3] *"I genuinely thought I'd got a chest infection um: (..) Then as my GP sort of- (..) confirmed that (.) I believed him and I took the antibiotics and I took stronger antibiotics... and then I'm told there are six thousand viruses out there and- so you believe them, they're the medics you know"*

## Discussion

This study used a qualitative approach to define the health beliefs and behaviour of working-age adults with occupational asthma symptoms through semi-structured interviews and thematic analysis. Four major themes were identified that were important in how workers behaved with regard to their asthma symptoms before diagnosis. There was a variation in how workers perceived the onset, the timing and the seriousness of their symptoms, and the evolution of their understanding was heavily dependent on how actively they pursued advice or a solution for their symptoms.

### *Understanding symptoms*

Understanding of symptoms varied between individuals from a lack of insight into the onset, pattern and nature of symptoms, through to misunderstanding of what they represented, or ignorance of the existence of asthma as a disease entity; indeed most workers who were interviewed failed to suspect or identify asthma as the cause for their symptoms initially. This is expected, since there is a variation in perception of asthma symptoms amongst non-occupational asthmatics, with poor insight and under-appreciation of severity of symptoms described in male and female adults of all ages and socio-economic backgrounds [23-25]. This may account for significant delays in diagnosis in the occupational setting, where latencies of 8-months or more between the onset of asthma symptoms and consulting a physician have been reported [8]. Many workers in the present study required a cue to action to change their health seeking behaviour, such as an illness event, a prompt by a family member or colleague, or a decline in physical function affecting their ability to work. However, despite evidence that UK Health and Safety Executive educational campaigns have reduced the incidence of occupational asthma related to certain individual exposures like isocyanates in motor-vehicle repair [26, 27], no worker in the present study indicated that a workplace educational intervention had changed their understanding of their own symptoms.

### *Working relationships*

Employers were perceived as ignorant of health matters, and ineffective or intimidating when dealing with workers' concerns, often because workers believed that their focus was on the financial cost of asthma (loss of productivity) rather than the human cost of ill health. Indeed workers feared being seen as unfit for work, losing their employment and suffering financially; for many it was understandably

more preferable to carry on in a job exposed to respiratory hazards, than to face unemployment or difficulties finding equivalent work. In the study by Bradshaw et al. [9], a significant proportion of workers with occupational asthma continued working with asthmagens that caused ongoing symptoms, since the fear of financial loss through job loss was greater than the concern for their own respiratory health. This is understandable as around 85% of workers who leave their employment (either become unemployed or find alternative work) suffer a loss of income of 22-50% [28-31]. Additionally, a large proportion of the costs of occupational asthma are borne by the individual worker (49%) rather than the employer (3%), who therefore has little incentive to act [5].

#### *Action, inaction and negotiation*

The current results highlighted that the evolution of a worker's understanding of their symptoms depended upon how motivated they were to define them, or seek a solution. Proactive workers would seek help from an accessible authority, who was usually the GP; some workers later became a source of authority themselves for other affected workers (the 'go-to' person). Motivations for seeking medical help were from enhanced internal foci on symptoms as they worsened or recurred, from the inability to work and earn money while experiencing symptoms, or through pressure from family members. Passive workers either took repeated episodes of sickness absence without further exploration of causation, or persisted at work with symptoms through fear of losing their job, a sense of responsibility to colleagues or their employer, or simply because they felt that the symptoms they were experiencing did not impact on their function. Indeed there is evidence that workers persist in work environments despite knowing they are being exposed to respiratory hazards, which in some cases actually cause them harm [16].

Although there was more than one pathway for accessing healthcare (some routes were closed off to several workers; if an employer had no formal occupational health provision, or there was no Trades Union representation) most workers saw their GP in the first instance. However, it was common for individuals to reflect on poor experiences, mainly generated by missed opportunities to identify work causation. The inability to identify causation was attributed to the GP's lack of enquiry, dismissing work-related information, oversimplifying symptoms or misdiagnosing. This is supported by data that shows GPs, who have an important role in screening for occupational asthma, fail to enquire about



occupational exposure and the effect of work on asthma symptoms [32] despite recent guidance [15]. In cross-sectional studies, GPs have cited insufficient time, lack of expertise and poor access to specialist services as barriers to diagnosis [8, 33, 34].

Proactive workers negotiated ineffective encounters by questioning poor explanations; however, passive workers repeatedly accepted poor explanations, even when their understanding of the work-symptom relationship was accurate. The health belief model explains differences in behaviour by variations in workers' health beliefs [35, 36]; these are core beliefs related to the perceived seriousness of- and susceptibility to a disease, personal costs and benefits of changing behaviour, and the presence of specific cues to action, such as illness events. Indeed, in this study there appear to be key influences motivating a worker to seek an explanation for their symptoms or a definitive solution (see Figure 1):

#### *Limitations*

Participants had a variety of causative exposures, and were broadly representative of workers with occupational asthma in the West Midlands, UK [14]. 80% of workers interviewed were British males, the rest were English-speaking ethnic minority workers. However some locally represented ethnicities, such as Irish, Somalian or Black African were not accounted for in the sample. The sampling strategy accommodated workers already diagnosed with occupational asthma and undergoing clinical follow-up, which may have introduced recall bias, and excluded those workers who had not yet sought, or had no intention of seeking healthcare, who may have different health beliefs. These biases limit generalizing the findings to all workers with work-related respiratory symptoms. Additionally data collection was not a purely inductive exercise because the interview schedule was determined beforehand, albeit loosely; a compromise was required to ensure that data collection was reasonably practicable. In order to increase truthfulness and reduce subjectivity, strategies such as deviant case analysis and triangulation via a critical friend, were employed.

*Conclusion and Implications for Practice*

This study aimed to gain an in depth understanding of the beliefs and behaviour of workers with occupational asthma symptoms, and define the major barriers to diagnosis on the part of the worker. Perceptions of asthma symptoms in the workplace varied, with some aspects such as lack of insight into symptom onset, and poor awareness of work-effect or the nature of chronic asthma, likely to predispose to a significant delay in diagnosis for many workers. These are basic insights that should be accounted for when designing workplace interventions, and should be considered in addition to the educational goals associated with work hazards and risk. Many symptomatic workers were discouraged from taking action through a fear of financial loss, or a lack of confidence that disclosure of symptoms would effect either a healthcare or workplace solution. Equipping workers with guidance on the diagnostic process and consequences of occupational asthma, along with strategies for negotiating solutions with healthcare professionals and employers, could empower workers to make more informed choices about their health, at an earlier stage in the disease process.

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<i>Patient number</i>	<i>Age</i>	<i>Gender</i>	<i>Ethnicity</i>	<i>Occupation</i>	<i>Exposure</i>	<i>FEV<sub>1</sub> (% predicted); litres</i>	<i>FVC (% predicted); litres</i>	<i>FEV<sub>1</sub>/FVC; %</i>
P1	64	Male	White British	Wood worker	Wood dust	2.07 (68)	3.47 (88)	60
P2	49	Male	Pakistani	Automotive assembly	Metalworking fluid	2.45 (93)	2.90 (92)	84
P3	49	Male	White British	Plumbing lecturer	Acidic solder flux	3.20 (81)	3.94 (80)	81
P4	52	Female	White British	Hospital cleaner	Cleaning agents	3.52 (140)	4.19 (143)	84
P5	36	Male	White (Polish)	Circuit-board repairer	Colophony solder flux	3.13 (70)	5.89 (109)	53
P6	57	Male	White British	Swimming pool supervisor	Chloramines	4.01 (96)	5.73 (111)	69
P7	55	Female	White British	Plastics moulder	Polymer fume	2.71 (100)	3.36 (106)	81
P8	48	Male	Asian British	Metalworker	Metalworking fluid	4.07 (108)	4.80 (105)	85
P9	48	Male	White British	Chemical engineer	Vitamin E	3.41 (97)	4.15 (96)	82
P10	52	Male	White British	French polisher	Wood dust	2.94 (80)	4.98 (110)	59
P11	55	Male	White British	Orthopaedic practitioner	Methyl methacrylate	3.19 (87)	3.76 (84)	85
P12	43	Male	White British	Metalworker	Chromium	3.94 (119)	5.22 (133)	76
P13	22	Female	White British	Anaesthetic nurse practitioner	Anaesthetic gases	3.21 (108)	3.63 (106)	88
P14	63	Male	White British	Adhesive development chemist	Isocyanates	2.49 (68)	3.49 (74)	71
P15	55	Male	White British	Car headliner assembler	Isocyanates	2.84 (85)	4.69 (113)	61
P16	58	Female	White British	Operating theatre nurse	Diathermy	2.89 (110)	3.55 (115)	82
P17	59	Female	Black Caribbean	Hospital ward nurse	Latex	1.66 (80)	1.9 (78)	87
P18	52	Female	White British	Curtain blind manufacturer	Isocyanates	1.06 (54)	2.26 (97)	47
P19	64	Male	White British	Security van driver	Diesel exhaust	2.05 (66)	2.52 (65)	81
P20	50	Male	White British	Spray painter	Isocyanates	3.72 (97)	4.78 (101)	78

**Table 1. Summary of all workers undertaking semi-structured interviews, showing demographics, occupations and causative agents. Spirometry was measured at the initial clinic visit according to European Respiratory Society/American Thoracic Society (ERS/ATS) standards using European Community for Coal and Steel predicted values [37]. FEV<sub>1</sub>: Forced expiratory volume in 1 second; FVC: Forced vital capacity.**

Theme	Sub-theme	Code
Theme 1: The worker's understanding of his/her symptoms	Lack of acceptance of symptoms as an illness	Poor insight into onset
		Considered to be normal
		Ignoring symptoms
	Lack of association of symptoms with work	Inability to see a pattern
		Noticed pattern but over-simplified
		Only makes link after significant event
	Failure to attribute symptoms to asthma	Accepts something is wrong but no appreciation it may represent asthma
		Misattribution to another illness
		No knowledge of asthma as a disease
Theme 2: Working relationships	Relationships with colleagues	Fear of talking between colleagues
		No culture of discussing health
	Relationships with management	Company structure (the artificial person)
		Ineffective management
		Ineffective individuals
		Focus on productivity over health
		Intimidation
		Attention only in light of authority advice
		Fear of job and financial loss
Theme 3: The worker's initial course of action	Proactive person response	Goes to the GP
		Goes to another authority
		Prompted to act by family members
		Becomes the "go-to" person
	Passive person response	Absenteeism
		Presenteeism
Theme 4: The worker's negotiation of healthcare encounters	Failure to initiate action by the GP	Failure to enquire about work at all
		Reliant on patient to offer work aspect
		Dismiss work effect on symptoms
		Oversimplify illness
		Misattribution of symptoms to another disease
	Proactive negotiation by the worker	Makes link with work-aspect themselves
		Requests a second opinion
	Passive acceptance of authority by the worker	Initial misunderstanding fuelled
		Initial understanding challenged

**Table 2. A summary of themes relating to the health beliefs and behaviours of workers with occupational asthma symptoms.**

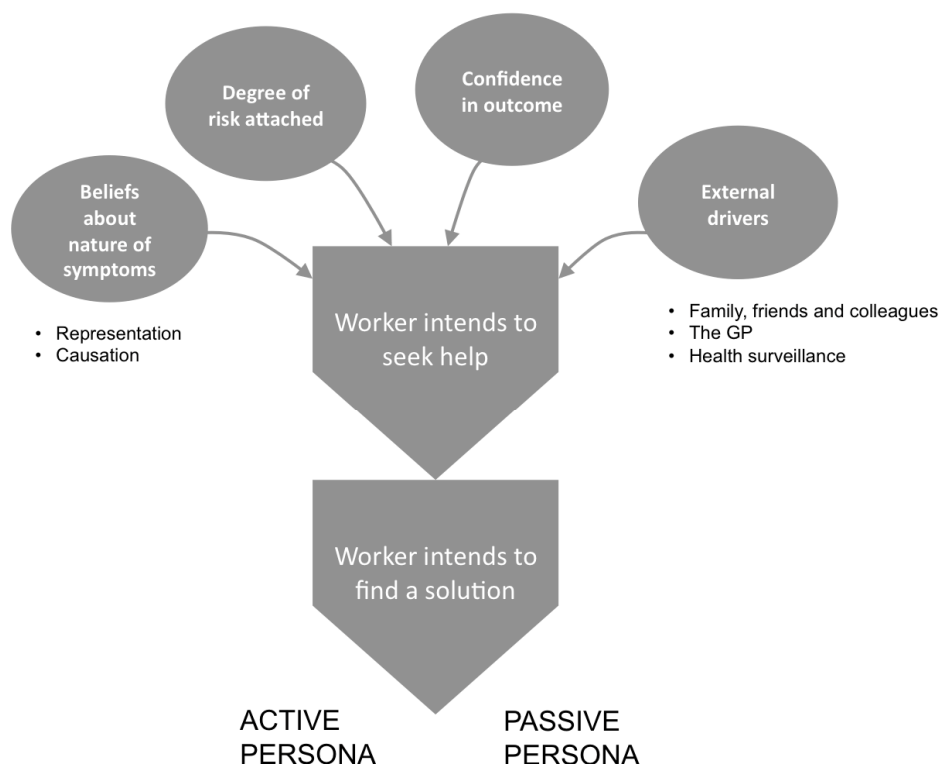
Normalising symptoms	
P17	<i>"I think I just thought the chemicals smelled strong (.) and I thought oh I'm just coughing because of the chemicals (.) I didn't put it that I was coughing because something was wrong with <u>my lungs</u>, I just put it that I was reacting to a smell"</i>
P10	<i>"I'd start feeling a little bit breathless and stuff but I was putting it down to maybe it's the patterns, because I hadn't done nights for a long time"</i>
P14	<i>"I didn't sort of feel (.) that I was ill and therefore that I'd got anything to talk about with the doctor, you know (.) I just thought I was unfit, compared with those eighty year olds running round"</i>
Ignoring symptoms	
P7	<i>"I just thought oh I've got a cough, I've got a cold, and then when I thought I'll go and see the doctor, it disappeared. So I thought oh I'm alright",</i>
P16	<i>"Well I think when you've got progressive things like weight loss or other things going on, then you get concerned, but when it's a cough you tend to ignore it=".</i>
Not linking work-related symptoms with workplace hazards	
P1	<i>"I just thought it can't be [work-related], because everybody would have it, that was in my head. There's people there who've been there as long as I've been there, twenty odd years and they're not even affected",</i>
P1	<i>"I didn't think it was work I didn't... 'cos if you went down to where I worked and looked (.) you wouldn't see that much dust"</i>
P6	<i>"That was it, thinking why should- you know why should work be a problem, it hasn't been a problem up to now? Why should it have sort of changed?"</i>
Failure to attribute symptoms to asthma	
P16	<i>"I thought I'd got a chest infection... Or just (.) a cold or something so I sort of ignored it"</i>
P9	<i>"I've had cancer before, a tumour on the back, so I was just worried if I'd got cancer on the chest"</i>
P7	<i>"Well I just wondered what it was, didn't know what it was, and because all my family have heart problems I just went and said to the doctor, I've got this horrendous (.) pain in the middle of my chest and in the middle of my back"</i>
P3	<i>"(.) That's when the adverts- campaign started, if you've had a cough for more than three weeks, get it checked out, it could be the start of [lung] cancer, so it did worry me to be honest"</i>
P8	<i>"I didn't know asthma (.) and just the fact that I had- (.) couldn't breathe, that's what it was. I don't know, I've got no mates with asthma, no one that I can compare notes with or anything like that".</i>

**Table 3. Workers' responses showing examples of the variation in perception of occupational asthma symptoms.**



<b>Discussion with colleagues</b>	
P19	<i>"If you talked about anything like that you got the sack (...) 'cos Company X [security company] in them days were a bullying company, and you daren't talk about anything".</i>
P7	<i>"But everybody's [work colleagues] frightened of losing their job aren't they? And because I'm a bit more- well I'll tell the management what I think, and they're [colleagues] a bit oh God no, we'll do it, you know, behind their back"</i>
P12	<i>"Yeah well there was er:: a group- there was possibly half a dozen of us that were all experiencing the problems and we were talking within ourselves, but you tend- in the industry, in the current climate, you feel sort of quite scared to say too much because you don't want it to impact on your future"</i>
P8	<i>"They couldn't give me a fix or anything, so it wasn't worth asking the question".</i>
P1	<i>"Then you get the resentment from off the peers that you are working with, because some of them are covering your work, you know".</i>
<b>Discussion with management</b>	
P8	<i>"They weren't helpful at all, because they don't think that they could inflict asthma or anybody or nothing",</i>
P1	<i>"One of the managers (.) ended up with the same type of thing as what I got (.) and... it wasn't until he got it himself he started to say "I didn't know it was like this, you know""</i>
P3	<i>"My manager's an absolute smashing bloke (..) but he's not a manager. He was put in place as a 'yes man'. He cannot make a decision without his manager telling him what to do basically"</i>
P20	<i>"They're totally unsympathetic, they're interested in making a buck and that's it... We live in a culture at the moment where we sue for this, that, and the other, they just wouldn't want you on the premises any more... There would be no sympathy... I've never been offered light duties in all my life, they're not going to say well we'll get him to do this, that and the other, it's just we'll find someone else"</i>
P18	<i>"I mean I had a heart attack and they didn't really- (.) they were concerned, but it was more for the business side I think, than my personal (.) [health and safety]"</i>
P4	<i>"You feel as if you um (.) if you don't come into work when you are ill (.) you get penalized, you know"</i>
P19	<i>"I mean the company pays for their own particular medical people, who'd say "that bloke is unfit for work, get rid of him" (.) just so I wouldn't take it any further (.)"</i>

**Table 4. Workers' responses showing examples of reluctance to talk with colleagues and management about their health problems.**



**Figure 1. The major influences on workers' health-seeking behaviour: 1) The belief that symptoms may represent asthma and the chronicity and pattern of symptoms is related to ongoing exposure at work, 2) Whether disclosure of symptoms to colleagues or employers is likely to effect any change in the workplace or workplace procedures, or conversely result in financial loss, 3) A worker's confidence in their GP (or other healthcare professional) that a consultation will result in an adequate diagnosis or solution, and 4) Whether there are external drivers, such as a prompt by a concerned colleague or family member, occupational health surveillance, or an effective healthcare consultation. The activity or passivity of workers' health-seeking behaviour is determined by the nature and extent of their prevailing beliefs.**

**Appendix (for online supplement)****Semi-Structured Interview Schedule version 2; 18/07/2013**Demographics

How old are you please?

How long have you been working for your current employer?

When were you diagnosed with occupational asthma?

Patient's understanding of their symptoms

When did you first realize you had problems with your breathing?

What symptoms or problems did you notice that caused you concern?

Did you understand that the symptoms might be asthma?

*(If not) Prompt: What did you think the symptoms might represent? Did you think that the symptoms might represent a disease?*

Did you see a pattern between the symptoms and your work?

Did you think that work might be causing your symptoms?

Patient's initial response to symptoms

What course of action did you take when you first noticed your symptoms?

Did you take time off work or did you continue at work whilst having symptoms?

*Prompt: Could you justify why you decided this? Why did you continue at work?*

Did you seek any help either at work, from health and safety or from your General Practitioner or other health care professional with your symptoms initially?

When did you first seek medical assistance?

Was there a distinct event (*illness event*) that caused you to seek help?

The General Practitioner and occupational asthma

How long have you known your General Practitioner / Practice Nurse?

Can you describe your relationship with them?

*Prompt: Do you trust them?*

*Prompt: Do you feel able to share information with them?*

Did they ask you about your job and the effect of work on your symptoms?

Did they make the link between work and your symptoms?

Did they make a diagnosis from your symptoms?

What actions resulted from consulting your General Practitioner?

*Prompt: Did your General Practitioner communicate with the specialist?*

#### *Social structure and occupational asthma*

Were there people or factors that helped you seek a diagnosis?

*Prompt: Do you have family, relatives or close friend that you spoke with about your symptoms?*

Is there any one in particular that you have shared your diagnosis or problems with? If so, why?

Are there any colleagues at work who you could share it with and why?

Are there any colleagues at work you wouldn't share it with and why?

#### *The employer and occupational asthma*

Do your employers know about your occupational asthma?

Did they have any input into diagnosing your symptoms?

Did you communicate with them about the symptoms before your diagnosis of occupational asthma?

*(If not) Prompt: If not, why not?*

*(If so) Prompt: If so, how did you find their reaction, and how did that make you feel about your symptoms?*

*Prompt: Did you feel that your doctor (Occupational Health Professional, General Practitioner, medical specialists) communicated well with you?*

Do you feel that there was good communication between all parties involved in your care?

Did you think that there was delay in the process of diagnosis?

*Prompt: If so, where do you think that was?*

**Highlights**

- This study aimed to explore the health beliefs of workers with occupational asthma.
- Twenty workers with suspected occupational asthma underwent semi-structured interviews.
- Thematic analysis identified four major influences on health-seeking behaviour.
- Perception of occupational asthma symptoms varied widely between individual workers.
- Workers were reluctant to discuss health issues with colleagues and managers.